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# Precipitation variability over the East African region and its relation with circulation patterns


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## 1. Motivation

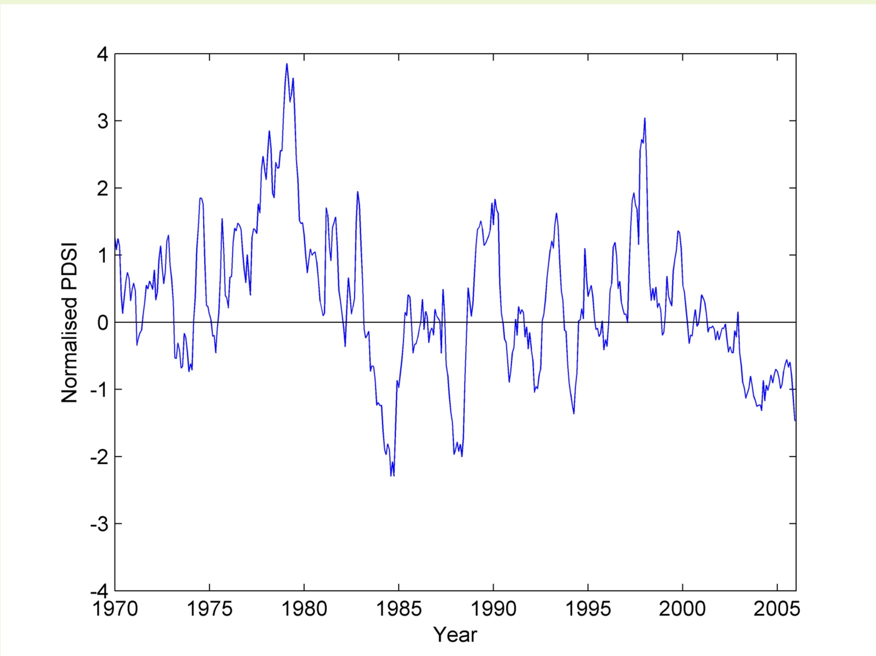


*Figure 1. Study area weighed normalised PDSI index (data: KNMI)*

- High interannual precipitation variability poses severe risks for population and food security

*Figure 2. Live Aid Concert 1985*

## 2. Setup

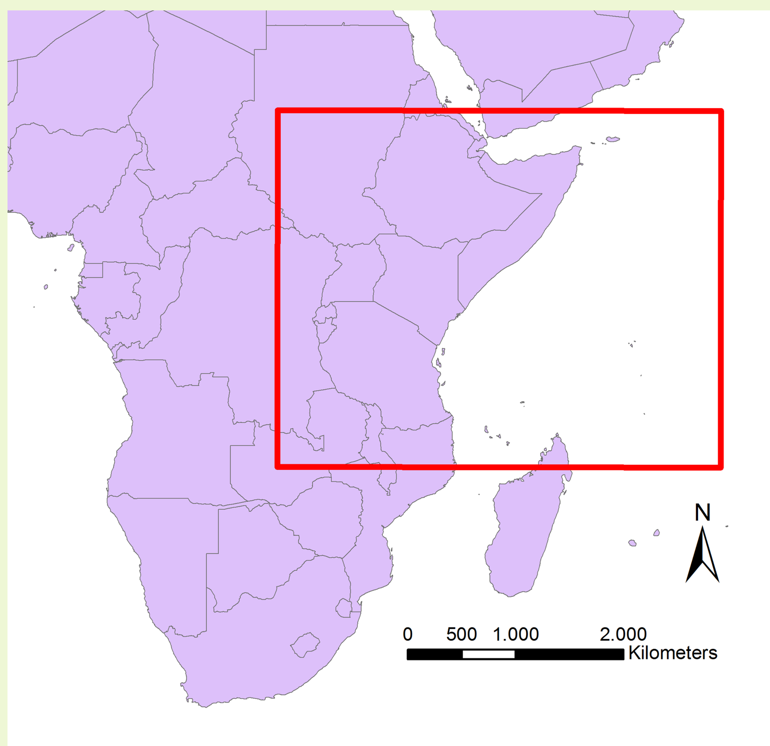


*Figure 3. Study area*

- 1981-2010
- ERA Interim data
- Relate Mean Sea Level Pressure to:
  - Total Precipitation
  - Large-Scale Precipitation
  - Convective Precipitation

## 3. COST733Class

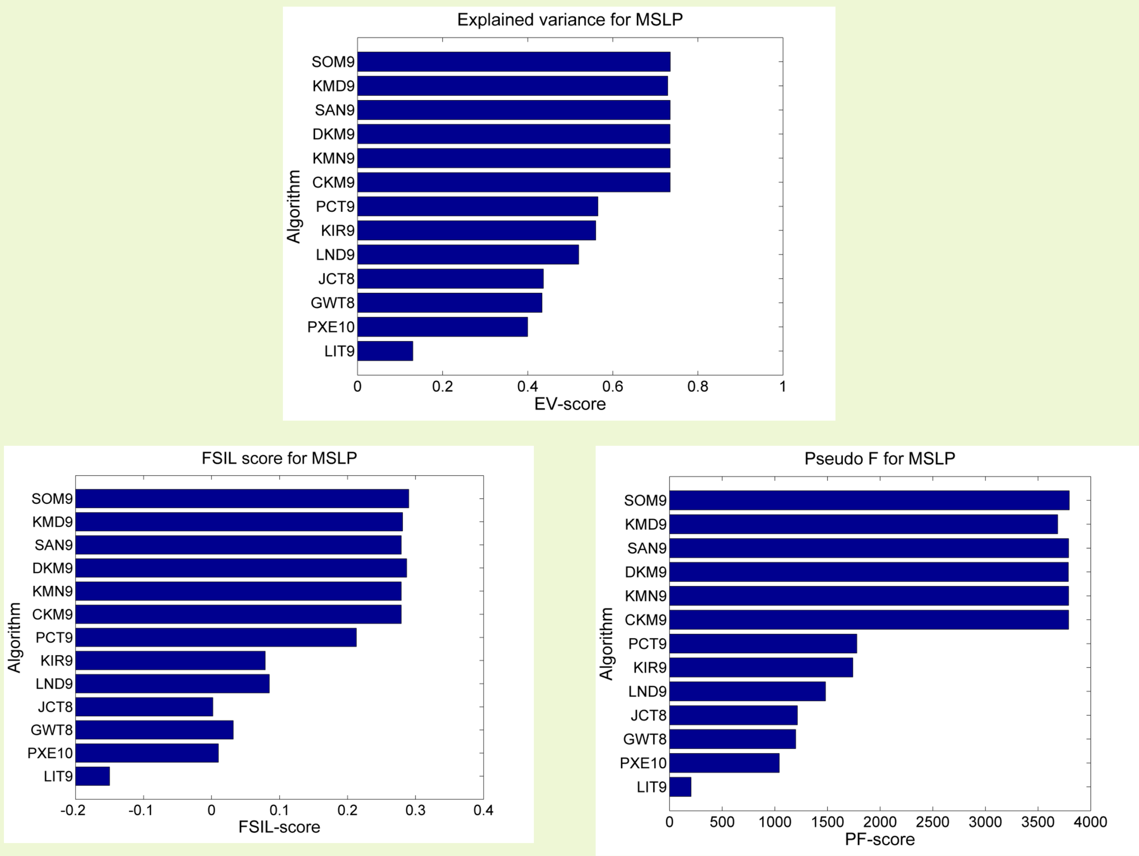


*Figure 4. Separability analysis regarding Mean Sea Level Pressure*

- Classify Mean Sea Level Pressure in different patterns
- Evaluate different classification algorithms with different separability measures
- Separating pressure patterns is considered most important
- Neural-network classifications perform best in separating pressure patterns

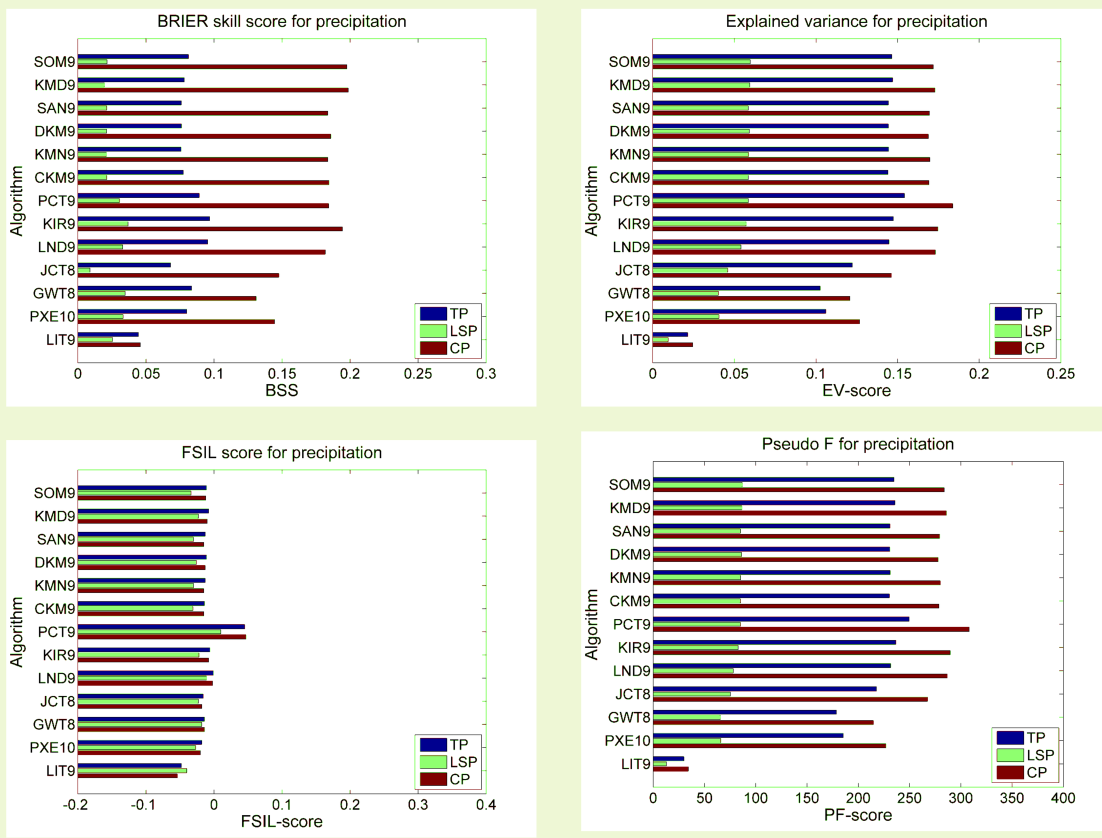


*Figure 5. Separability analysis regarding precipitation*

## 4. Weather Atlas

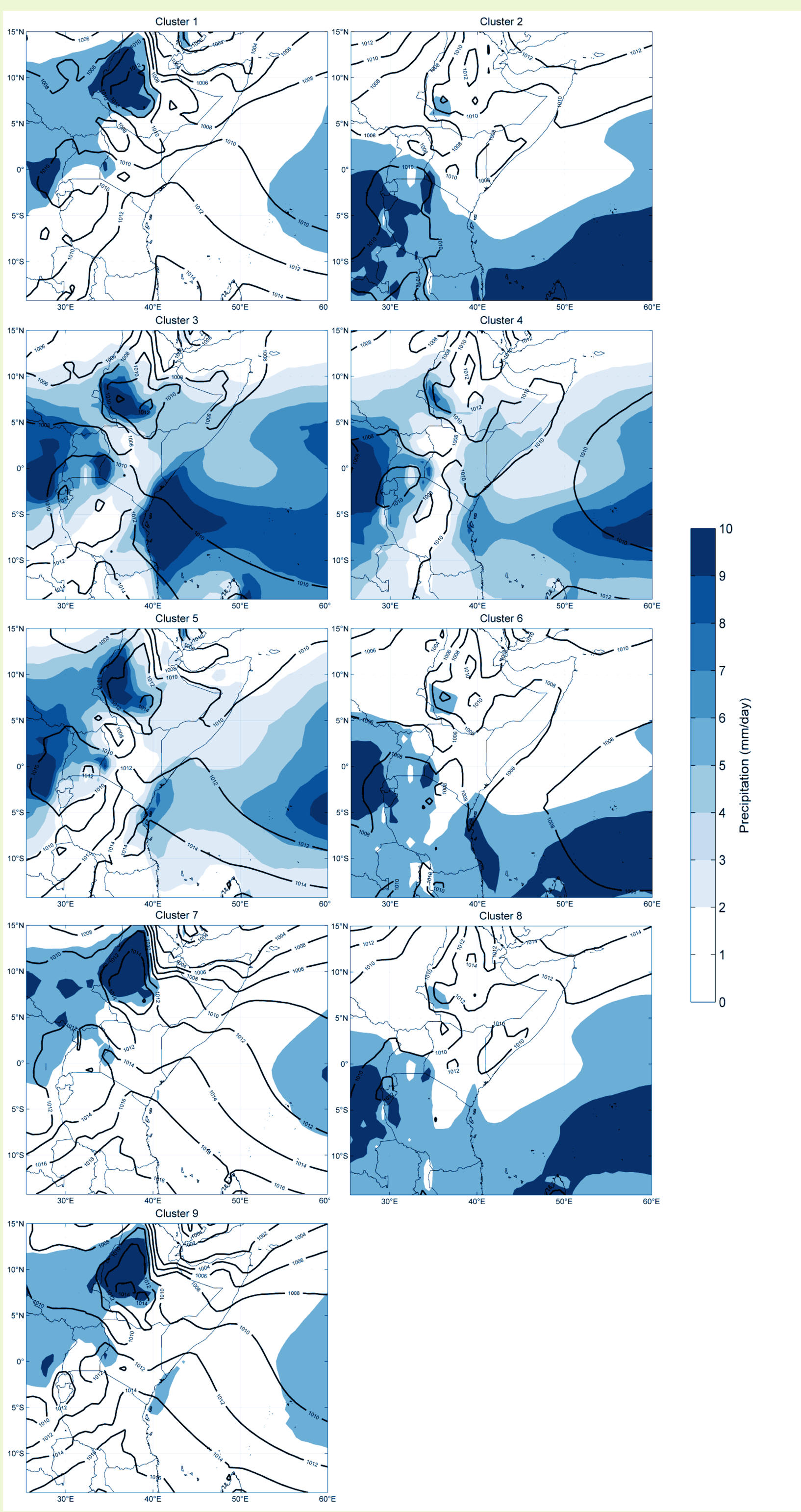

*Figure 6. Results of the best classification algorithm*

| Month | C1 | C2 | C3 | C4 | C5 | C6 | C7 | C8 | C9 |
|---|---|---|---|---|---|---|---|---|---|
| January | 0 | 45.7 | 0 | 4.6 | 0 | 8.1 | 0 | 41.6 | 0 |
| February | 0 | 42.7 | 0.1 | 9.2 | 0 | 24.3 | 0 | 23.7 | 0 |
| March | 0 | 20.6 | 5.4 | 18.2 | 0.1 | 45.5 | 0 | 10.2 | 0 |
| April | 0 | 2.6 | 52.5 | 11.2 | 2.6 | 28.8 | 0 | 2.3 | 0 |
| May | 5.4 | 0 | 52.4 | 1.0 | 14.4 | 2.8 | 3.0 | 0 | 21.0 |
| June | 7.0 | 0 | 2.2 | 0 | 0.7 | 0 | 33.4 | 0 | 56.7 |
| July | 2.5 | 0 | 0 | 0 | 0.1 | 0 | 56.8 | 0 | 40.6 |
| August | 14.7 | 0 | 0 | 0 | 4.3 | 0 | 47.2 | 0 | 33.8 |
| September | 48.6 | 0 | 0.4 | 1.4 | 32.8 | 0.1 | 7.8 | 0 | 8.9 |
| October | 9.1 | 0 | 1.7 | 49 | 35.3 | 3.3 | 0 | 1.6 | 0 |
| November | 0 | 9.4 | 0.6 | 51.4 | 3.2 | 10.3 | 0 | 25.1 | 0 |
| December | 0 | 36.4 | 0 | 13.3 | 0 | 6.3 | 0 | 44.0 | 0 |

*Figure 7. Occurrence of different circulation types per month in the period 1981-2010*

- Distinct seasonal patterns are visible
- Precipitation patterns are clearly related to circulation
- Droughts / wet spells are mostly related to differences in interannual frequency of circulation patterns

## 5. (Near-) future results

- Classify pressure patterns of COSMO-CLM present (1989-2010) and future (2081-2100) simulations
- RCP8.5 scenario
- Relate changes in precipitation and PDSI (variability) to changes in circulation patterns
- Changes in circulation pattern frequency and the patterns itself
- Relate circulation pattern occurrence to El Niño / La Nina events
- Possible relation with dry / wet periods
- Clear correlation between Nino3.4 index and precipitation observations in the long rain season (October, November, December).
- Possible lagged relation in the short rain season (March, April, May)

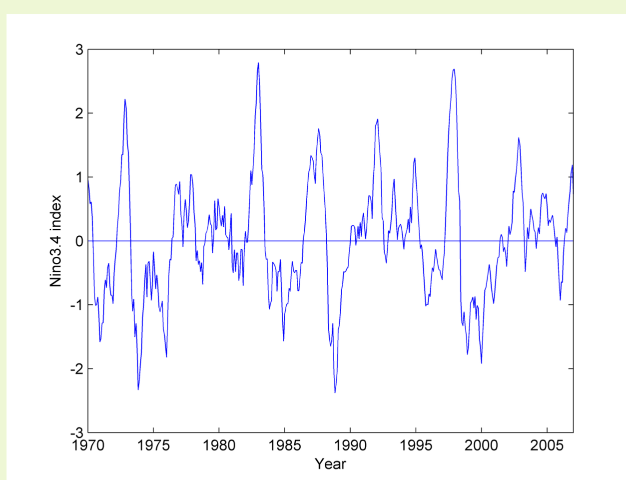


*Figure 8. Nino 3.4 index (data: KNMI)*

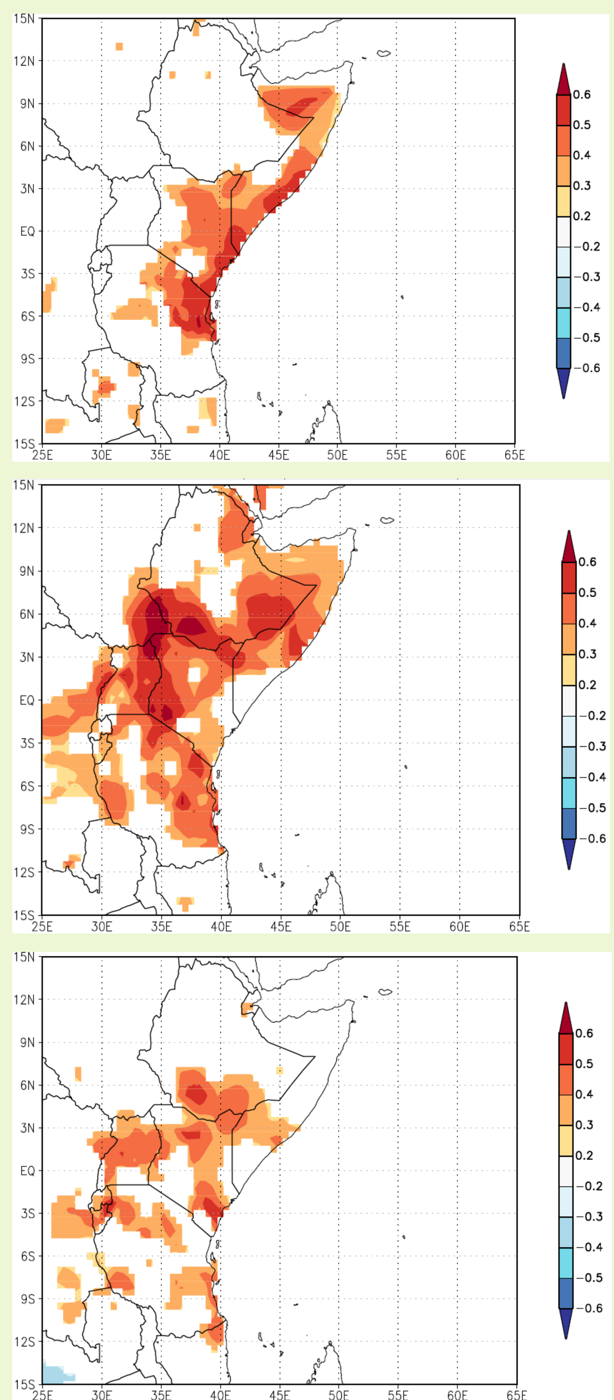

*Figure 9. Correlation between Nino 3.4 and precipitation (CRU) for Oct, Nov and Dec (data: KNMI)*

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